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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/932,986	08/21/2001	Mark S.F. Clarke	USRA-SWCNT VI	6829

7590 08/13/2003

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EXAMINER	
LISH, PETER J	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 08/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/932,986	Applicant(s) CLARKE ET AL.	
	Examiner Peter J Lish	Art Unit 1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-2, 4-5, and 7-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5,7,15-18 and 20* is/are rejected.

7)☒ Claim(s) *8-14 and 19* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2,3,5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Applicant's arguments, filed 5/28/03, with respect to the rejection(s)of claim(s) 1-19 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless – (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 7 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lobovsky et al. (US 2002/0113335).

Lobovsky teaches a process for dispersing single-walled nanotubes in a solvent using an anionic surfactant, cationic surfactant, or nonionic surfactant. Amongst those listed are ammonium chlorides, alkylphenol ethoxylates, and polyoxyethylene surfactants (paragraph 0050). While it is not explicitly taught that these surfactants, or detergents, have a hydrophilic-lipophilic balance of less than 13.2, it is expected to be the case, because the surfactants are equivalent to those listed in the instantly claimed invention. No difference is seen between the method of Lobovsky et al. and that of the instantly claimed invention.

Claim Rejections - 35 USC § 103

Claims 1-2, 4-5, 7, 17-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonard et al. ("Purification and Size-Selection of Carbon Nanotubes") in view of Lobovsky et al.

Bonard teaches a method purifying and separating nanotubes from raw material by dispersing the material in water with the use of surfactants. The dispersal of water-nanotube suspensions stabilized with surfactants is very dependent on the critical micellar concentration (CMC) of the surfactant. The optimum dispersal was reached at slightly above 100% of the CMC, and tests show that below this amount, for example at 40% of the CMC, the total amount of suspended nanotubes is smaller. It therefore would have been obvious to one of ordinary skill at the time of invention to use the dispersing surfactant at between 50% and 95% of the CMC, in order to achieve complete dispersion.

While Bonard specifically uses sodium dodecyl sulphate (SDS) as the surfactant, any surfactant that is capable of obtaining metastable nanotube suspensions is useful in the process of Bonard. Lobovsky et al. teach a method for dispersing nanotubes using a variety of solvents, including SDS, ammonium chlorides, alkylphenol ethoxylates, and polyoxyethylene surfactants (paragraph 0050). While it is not explicitly taught that these surfactants, or detergents, have a hydrophilic-lipophilic balance of less than 13.2, it is expected to be the case, because the surfactants are equivalent to those of the instantly claimed invention. It would have been obvious to one of ordinary skill at the time of invention to use the surfactants taught by Lobovsky et al. in the process of Bonard et al. in order to achieve nanotube suspensions.

While Bonard et al. do not explicitly teach that the nanotubes are single-walled nanotubes, it is expected that at least a portion of the nanotubes are single-walled because they are produced by an arc-discharge process, which is known to produce single-walled nanotubes. Alternatively, it would have been obvious to one of ordinary skill at the time of invention to use single-walled carbon nanotubes in the process of Bonard et al. Since Bonard encompasses them.

Regarding claims 17-18, Bonard et al. also teach that the nanotube suspensions may be passed through a filter to form a purified filtrate. While the pore size of the filter is not specifically taught, the selection of a pore size is viewed to be the optimization of a known process, which could have been determined through routine experimentation, and which is held to be obvious by In re Boesch, 205 USPQ 215.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bonard in view of Lobovsky as applied to claims 1 and 17 above, and further in view of de Heer et al. ("Aligned carbon nanotube films...").

Bonard et al. do not explicitly teach the use of filters with pore sizes of no greater than 0.20 microns. De Heer et al. teach a process of filtering carbon nanotubes from suspension by drawing them through a 0.20 micron pore ceramic filter. It would have been obvious to one of ordinary skill at the time of invention to use the filter of de Heer et al. in the process of Bonard et al. to achieve a higher degree of nanotube separation by sizes.

Claims 1 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley et al. (US 2003/0133865).

Smalley et al. teaches dispersing single-walled carbon nanotubes using sulfonic acid (paragraph 0043).

Regarding claim 15, the upper limit to the effective amount of sulfonic acid needed to create a dispersion is not explicitly taught, however the determination of the upper limit is viewed to be the optimization of a known process, which could have been determined through routine experimentation, and which is held to be obvious by In re Boesch, 205 USPQ 215.

Regarding claim 16, Smalley does not give specific examples of the types of sulfonic acids, however, it does teach that alkyl sulfonic acids are useful. The selection of a specific alkyl sulfonic acid, such as heptane sulfonic acid or octane sulfonic acid, is viewed to be the selection of a known alkyl sulfonic acid based on its suitability for the intended use of dispersing single-walled carbon nanotubes, which is held to be obvious by In re Leshin, 125 USPQ 416.

Allowable Subject Matter

Claims 8-14 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 703-308-1772. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-305-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

PL
August 4, 2003

STUART L. HENDRICKSON
PRIMARY EXAMINER